# Binge Drinking and Risky Sexual Behavior among HIV-Negative and Unknown HIV Status Men who have Sex with Men, 20 U.S. Cities

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## Abstract

**Background**—Men who have sex with men (MSM) represent over half of new HIV infections in the United States. It is important to understand the factors associated with engaging in risky sexual behavior to develop effective prevention interventions. Binge drinking ( 5 drinks on 1 occasion) is the most common form of excessive alcohol consumption. This study examines the relationship between binge drinking and sexual risk behaviors among MSM who are current drinkers and who were either HIV-negative or unaware of their HIV status.

**Methods**—Using the 2011 National HIV Behavioral Surveillance system and multivariable Poisson models with robust error estimates, we assessed the association between binge drinking and sexual risk behaviors among current drinkers. Prevalence ratios (PR) and 95% confidence intervals (CI) are presented.

**Results**—Overall, 85% of MSM were current drinkers, and 59% of MSM who drank reported 1 episode of binge drinking in the preceding 30 days. In multivariable models, binge drinking was associated with condomless anal intercourse (CAI) at last sex with an HIV-positive or unknown status partner (receptive: PR 1.3, 95% CI 1.1-1.6; insertive: PR 1.2, 95% CI 1.0-1.4), having exchanged sex for money or drugs at last sex (PR: 1.4, 95% CI 1.1-1.7), having concurrent

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partners in the past year (PR: 1.1, 95% CI 1.1-1.2), and having more CAI partners in the past year (PR: 1.2, 95% CI 1.0-1.4) compared to non-binge drinkers.

**Conclusions**—Evidence-based strategies for reducing binge drinking could help reduce risky sexual behavior among MSM.

## Keywords

binge drinking; men who have sex with men; anal intercourse; risky sex behaviors; HIV

## 1. INTRODUCTION

Men who have sex with men (MSM) are disproportionately affected by HIV in the United States, with two-thirds of incident HIV infections in 2010 occurring among MSM (Centers for Disease Control and Prevention, 2012). Furthermore, the Centers for Disease Control and Prevention (CDC) estimates that the number of incident HIV infections increased 12% among MSM when comparing 2008 to 2010 (Centers for Disease Control and Prevention, 2012). Given the high and increasing burden of HIV among MSM, it is important to assess modifiable risk factors for HIV acquisition in this population to develop more effective HIV prevention strategies.

Excessive alcohol use is responsible for 88,000 deaths and 2.5 million years of potential life lost (YPLL) in the U.S. each year (Centers for Disease Control and Prevention, 2013a), and cost the U.S. about $224 billion in 2006 (Bouchery et al., 2011). Binge drinking is responsible for over half of these deaths, two thirds of the YPLL, and three-quarters of the economic costs (Stahre et al., 2014). Binge drinking, defined as consuming 5 drinks for men or 4 drinks for women on an occasion (i.e., in about 2 to 3 hours) (National Institute of Alcohol Abuse and Alcoholism, 2004), has also been associated with a wide range of health and social problems, including unintentional injuries, violence, and alcohol poisoning (Centers for Disease Control and Prevention, 2014a; Naimi et al., 2003).

Studies have also shown that binge drinkers are more likely than non-binge-drinkers to engage in HIV risk behaviors, including injection drug use, exchange of sex for money/ drugs, and anal sex without a condom (Wen et al., 2012). Binge drinking has also been directly associated with an increased risk of HIV infection (Baliunas et al., 2010; Shuper et al., 2010). However, the specific relationship between binge drinking, risky sexual behavior, and the risk of HIV infection among MSM is not well established. Furthermore, studies of binge drinking and risky sexual behaviors among MSM have not defined this drinking pattern consistently using standard definitions, making it difficult to compare findings across studies and populations. Some studies have found an association between heavy drinking, defined as 6 or more drinks on one occasion or 4 or more drinks on a daily basis, and condomless anal intercourse (CAI) (Colfax et al., 2004; Koblin et al., 2003; Woody et al., 1999); binge drinking at least weekly and CAI with a discordant partner (Ekstrand et al., 1999); binge drinking at least weekly and a greater number of male partners (Greenwood et al., 2001); and heavy drinking and HIV acquisition (Koblin et al., 2006). Yet, episode-level studies that ask about condom use and alcohol consumption at a specific sexual event have shown inconsistent findings. A study among young MSM found no association between

drinking to intoxication, which is strongly correlated with binge drinking, and CAI (Pollock et al., 2012). Others have found no association between alcohol use before sex and CAI or discordant CAI (Clutterbuck et al., 2001; Gillmore et al., 2002; Seage et al., 1998). Additionally, other studies found no association between the amount of alcohol consumed before sex and lack of condom use, but did find significant moderating effects by age, sensation seeking, and alcohol consumption levels (Mustanski, 2008; Newcomb, 2013; Newcomb et al., 2011). In contrast, a few studies have found an association between drinking heavily before sex and CAI (Colfax et al., 2004; Lambert et al., 2011; Vanable et al., 2004). Therefore, findings on drinking before sex are mixed, but drinking heavily, 4-6 drinks, has been shown to influence condom use (Woolf and Maisto, 2009). These discordant findings are particularly concerning given the high rates of alcohol consumption (84%) and binge drinking (57%) in the MSM population (Finlayson et al., 2011), and thus the need for consistent public health messages about the relationship between binge drinking and risky sexual behavior among MSM. Our analysis will address some of the limitations of previous work by using a standard definition of binge drinking in order to assess this behavior specifically instead of a measure that combines different patterns of excessive alcohol consumption (National Institute of Alcohol and Alcoholism, 2004). Binge drinking was selected as the focus of this analysis instead of other measures of excessive alcohol use due to the high prevalence and the large public health impact of this behavior (Naimi et al., 2003).

The purpose of this study, therefore, is to describe the prevalence and frequency of binge drinking in a sample of MSM from 20 cities across the United States using a standard definition of this behavior, and to assess the association between binge drinking and several risky sexual behaviors, including having concurrent partners, exchanging sex for money or drugs, and the number of CAI partners, which have generally not been assessed in other studies.

## 2. METHODS

### 2.1 Sample and Procedures

The National HIV Behavioral Surveillance (NHBS) system conducts annual surveys and HIV testing in populations at risk for HIV, including men who have sex with men (MSM), injection drug users, and heterosexuals at increased risk of HIV (Gallagher et al., 2007). In 2011, the third round of MSM data collection was conducted in 20 metropolitan statistical areas (MSA) across the United States, which were selected based on the high number of people living with AIDS (Atlanta, Georgia; Baltimore, Maryland; Boston, Massachusetts; Chicago, Illinois; Dallas, Texas; Denver, Colorado; Detroit, Michigan; Houston, Texas; Los Angeles, California; Miami, Florida; Nassau, New York; Newark, New Jersey; New Orleans, Louisiana; New York City, New York; Philadelphia, Pennsylvania; San Diego, California; San Francisco, California; San Juan, Puerto Rico; Seattle, Washington; and Washington, District of Columbia). MSM were recruited by venue-based time-space sampling. The steps involved in this sampling method include: 1) formative assessment to identify venues and times to recruit MSM; 2) development of a sampling frame of eligible and accessible venues and day-time periods; 3) random selection of the venues and day-time

periods; and 4) recruitment, interviewing, and testing of MSM during the sampled events (MacKellar et al., 2007). Venues included bars, dance clubs, fitness clubs or gymnasiums, Gay Pride events, parks or beaches, large dance parties (e.g., raves or circuit parties), cafés or restaurants, retail businesses, sex establishments or sex environments, social organizations, and street locations. These methods have been described in more detail in other publications (Finlayson et al., 2011; Wejnert et al., 2013).

Eligibility for the MSM cycle of NHBS was restricted to persons who were born male, and identified as male, aged 18 years and older, residents of a study MSA, able to complete the survey in English or Spanish, those who were able to provide informed consent, and those who reported ever having oral or anal sex with another man. Participants were approached by trained interviewers, and if eligible and gave consent, were administered a questionnaire via a handheld computer. Anonymous HIV testing was offered to all participants and was conducted following the interview. Participants received an incentive for completing the interview and the HIV test. The incentive format (cash or gift card) and amount varied by city based on formative assessment and local policy. A typical incentive included $25 for completing the interview and $25 for providing a specimen for HIV testing. NHBS activities were approved by local institutional review boards in each participating city and were determined to be research in which CDC was not directly engaged.

For this analysis, the sample was further restricted to only men who completed the interview with valid responses, reported having oral or anal sex with another man in the previous 12 months, did not report being HIV-positive, and reported drinking alcohol in the previous 30 days (i.e. current drinkers). Self-reported HIV-positive men were not included in the analysis because once an individual is aware of their positive HIV status they typically modify their behavior (Fox et al., 2009). In addition, we only included MSM who reported current drinking because this was almost a universal behavior (85%) among the sample and we wanted to focus on the increased risk from binge drinking compared to those who drink but do not binge.

### 2.2 Measures

Several drinking patterns were assessed among MSM: Frequency of drinking was based on the question, "During the past 30 days, on how many days did you drink any alcohol?" This continuous response was categorized into three groups: 1-3 days = <1 day per week; 4-8 days = 1-2 days per week; and 9+ days = > 2 days per week on average. These categories were chosen for comparability because they are commonly used in publications on excessive alcohol consumption. Usual quantity of drinks on drinking days was based on the question, "During the past 30 days, on the days when you drank alcohol, how many drinks did you usually have?" This continuous response was categorized into 5 groups: 1 drink, 2 drinks, 3 drinks, 4 drinks, and 5 drinks on average per drinking-day. These categories were chosen based on the distribution of responses in the data and the fact that binge drinking is defined as 5 drinks in one sitting for men. Therefore, men reporting 5 or more drinks on a typical drinking-day were categorized as a distinct category. Binge drinking was based on a non-zero response to the question, "During the past 30 days, how many times did you have 5 or more alcoholic drinks in one sitting?" This binge drinking variable was used as the primary

exposure of interest. The number of binge drinking episodes that were reported was also categorized into four groups: 1-2 episodes, 3-4 episodes, 5-9 episodes, and 10 episodes. These groups were chosen based on the distribution of responses.

Several sexual risk behaviors were also assessed among MSM, including CAI with a discordant partner at last sex, which was defined as sex where the HIV status of either the respondent or their partner was unknown, or men who reported having an HIV-positive partner. Receptive CAI and insertive CAI were evaluated separately as outcomes. Concurrent partners was defined as a man responding "yes" to the question, "During the time you were having a sexual relationship with this (last) partner, did you have sex with other people?" If the relationship was longer than a year, the time frame of the question was restricted to the previous 12 months. Exchange sex with a male partner in the past year was defined as any man who reported giving or receiving drugs or money in exchange for sex at last sex. The fifth outcome was a count of the number of CAI partners reported in the previous 12 months.

The selected outcomes were chosen to represent a variety of sexual risk behaviors important in HIV transmission and acquisition. Many studies in the past have looked at CAI, but in our study we had the ability to be more specific about the type of risk behavior. Therefore, we looked at discordant CAI for both insertive and receptive intercourse. Exchange sex and concurrency have also been shown to be associated with increased risk of HIV infection, but their association with binge drinking is not well understood. Therefore, these behaviors were also included in our analysis.

### 2.3 Statistical Analysis

Chi-square analysis was used to assess statistical significance for categorical variables and a one-way analysis of variance was used for the continuous measures. Multivariable models based on a Poisson distribution with robust standard errors were used to assess the association between binge drinking and several sexual risk behaviors as outcomes, while adjusting for confounding factors, including race (white non-Hispanic, black non-Hispanic, Hispanic, and other); age (18-24, 25-34, 35-49, 50); education (< high school, high school, some college, college graduate); annual household income ($0-$19,999, $20,000-$39,999, $40,000-$59,999, $60,000); recruitment venue type (bar/club vs. other); drug use in the previous 12 months (reporting any drug use in previous 12 months not including marijuana); and the city where the study was conducted. Confounders were selected based on *a priori* knowledge and statistical significance with both the exposure and outcomes of interest. To add to the comparability of the models, the same confounders were included in all models. A second model was run for all the outcomes to assess the impact of binge drinking frequency on engagement in sexual risk behaviors. These models were limited to those who reported binge drinking. Adjusted prevalence ratios (PR) and 95% confidence intervals (CI) were estimated.

## 3. RESULTS

During the 2011 data collection period, 39,792 men were approached for recruitment and, of those, 12,123 (30.5%) were screened to determine if they were eligible to participate in the

study. Of the men who were screened, 9,819 (81%) were eligible, gave consent, and completed the survey with valid responses. An additional 1,807 men were dropped from the analysis for either not having sex with a man in the past 12 months (n = 527) or self-reporting being HIV-positive (n = 1,337), leaving a sample size of 8,012. Of the MSM included in the analysis, 6,813 (85%) reported current drinking, 4,008 (50%) reported binge drinking, and 1,720 (21%) reported drinking five or more drinks on a typical drinking day (data not shown). Because of the high prevalence of current drinking in this population, the remainder of this analysis focused on MSM who were current drinkers and responded to the binge drinking question (n = 6,796).

The largest proportion of MSM who were current drinkers were aged 18-49 years (90%); non-Hispanic white (42%); and those with some college (34%) or college graduates (39%). Most of the study participants (70%) were recruited from bars or clubs, and about one-third (36%) reported using illicit drugs in the previous year.

The prevalence of binge drinking among MSM who were current drinkers was 59% (Table 1). The prevalence of binge drinking was significantly higher among men aged 25-34 (63%), and non-Hispanic whites (63%) and Hispanics (61%). The prevalence was also higher among those who reported drug use in the previous year (70%) and those who were recruited at a bar or club (62%).

MSM who binge drank reported an average of 6.3 episodes/month (Table 1). The frequency of binge drinking did not vary significantly by age or race/ethnicity, but was significantly and inversely associated with education and income, and was highest among those with less than a high school education (8.8 episodes/month) and those with an annual household income of less than $20,000 (7.2 episodes/month).

MSM who binge drank were significantly more likely to report drinking two or more days per week than non-binge drinkers (59% vs. 27%, p<.001), and were significantly more likely to report consuming an average of five or more drinks per drinking day (Table 2). In addition, 22% of MSM who binge drank reported 10 or more episodes in the previous month.

Overall, the prevalence of sexual risk behaviors was significantly higher among MSM who binge drank than among non-binge drinkers, and the average frequency of binge drinking was higher among those who engaged in risky sexual behaviors (Table 3). The average number of CAI partners in the previous year was 1.9 among those who binge drank compared to 1.4 among those who did not binge (p<.01). After adjusting for potential confounders, binge drinking by MSM was still significantly associated with risky sexual behaviors, including receptive CAI with a discordant partner at last sex (PR = 1.33, 95% CI 1.09-1.62), insertive CAI with a discordant partner at last sex (PR = 1.20, 95% CI 1.02-1.41), exchange sex at last sex (PR = 1.35, 95% CI 1.06-1.70), having concurrent partners (PR = 1.11, 95% CI 1.05-1.18), and number of CAI partners (PR = 1.18, 95% CI 1.01-1.37) (Table 4).

To investigate the effect of frequency of binge drinking among those who binge drink, additional models were run restricting the sample to those who binge drank in the previous

30 days (Table 4). MSM who reported 10 or more binge drinking episodes in the previous month were 42% more likely to have receptive CAI with discordant/unknown partner at last sex, 85% more likely to have an exchange partner at last sex, and 40% more likely to have an additional CAI partner compared to those who reported 1-2 binge drinking episodes in the previous month. MSM were also more likely to have concurrent partners if they reported 5-9 binge drinking episodes (aPR =1.14; 95 % CI=1.03-1.26) or 10 or more binge drinking episodes (aPR =1.22; 95 % CI=1.11-1.33) in the previous month compared to men who reported 1-2 binge drinking episodes.

## 4. DISCUSSION

This study found that almost all MSM surveyed (85%) were current drinkers, and among those who drank, about three out of five reported past-month binge drinking an average of six episodes per month. Approximately 1 in 5 MSM who binge drank reported an average of 10 or more episodes in the previous month. Furthermore, compared to non-binge drinkers and after adjusting for other important factors that could affect the relationship between binge drinking and risky sexual behavior, MSM who binge drank were 33% more likely to report discordant receptive CAI and 20% more likely to report discordant insertive CAI at last sex. Men who binge drank were also 35% more likely to report giving or receiving drugs or money in exchange for sex at last sex, 11% more likely to report having concurrent partners, and 18% more likely to report more CAI partners in the previous year.

The prevalence of binge drinking among MSM was higher than among men in the general population. According to the 2011 Behavioral Risk Factor Surveillance System (BRFSS), the prevalence of binge drinking among all men was 25%, and among those that binge drank, the average number of episodes in the previous month was 4.6 (95% CI 4.0 – 4.7) (Kanny et al., 2013). In comparison, the binge drinking prevalence among all MSM in our sample was 50% and the average number of episodes among those who binge drank was 6.3. When our sample was limited to current drinkers, the binge drinking prevalence was 59%, which is also higher than the binge drinking prevalence among current drinkers reported in the 2001 BRFSS (36%) (Naimi et al., 2003). This higher prevalence could reflect a truly higher rate of binge drinking among MSM compared to the general male population sampled in BRFSS, or it could be related to the difference in sampling methods. BRFSS is sampled by random digit-dialing and NHBS is sampled using venue-based sampling, where a majority of men were recruited from bars and clubs. It is difficult to assess whether the prevalence of binge drinking in the NHBS MSM sample is comparable to other MSM samples that were not recruited in bars or clubs (Gillmore et al., 2002; Greenwood et al., 2001; Mayer et al., 2013), as most other studies on excessive alcohol consumption among MSM report a weekly, rather than a previous 30 days, binge drinking prevalence. In the San Francisco Young Men's Health Study, the prevalence of binge drinking at least weekly was 14% (Greenwood et al., 2001), and in a sample of HIV-positive men in Boston the weekly binge drinking rate was 23% (Mayer et al., 2013). In a community sample of MSM from a Northwestern city, 27% reported drinking at least five drinks on a typical drinking occasion (Gillmore et al., 2002). This is comparable to the rate of typically drinking five or more drinks in a drinking day in our sample, which was 21% among all men.

Our finding that MSM who binge drank were more likely than non-binge drinkers to report engaging in condomless sex is consistent with the findings of other studies (Colfax et al., 2004; Ekstrand et al., 1999; Koblin et al., 2003). We also found that MSM who binge drank were more likely than non-binge drinkers to exchange sex for drugs or money and to have concurrent partners. This suggests that binge drinking potentially affects more than just the decision to use a condom during sex. It is associated with a wide range of sexual risk behaviors. It should be noted that the prevalence of receptive and insertive CAI and exchange sex at last sex were all low. Therefore, the increase among those who binge drink, although statistically significant, was not substantial. However, these measures are only based on behavior during a single sexual event, if the risk was added up over multiple sexual encounters the impact would be larger. In addition, binge drinking is associated with multiple behaviors. Therefore, if reducing binge drinking had an effect on all these behaviors, the cumulative reduction in risk would potentially be more substantial. In addition, for all outcomes except insertive CAI with a discordant or unknown partner, we found that MSM who reported 10 or more binge drinking episodes in the previous month were significantly more likely to engage in sexual risk behaviors than those who reported 1-2 binge drinking episodes in the previous month. This suggests an escalation in risk as frequency of binge drinking increases. It is unclear why insertive CAI with a discordant partner is the one behavior that was not associated with 10 or more binge drinking episodes in the previous month. Insertive anal intercourse carries a lower risk of HIV acquisition than receptive anal intercourse; it could be that men engaging in this behavior were selecting a practice perceived to carry lower risk and this decision may have been less influenced by binge drinking (Irwin et al., 2006).

One possible explanation for the association between binge drinking by MSM and sexual risk behaviors is that people with certain personality traits, such as sensation seeking, are more likely to binge drink and to engage in risky sexual behaviors, but that one is not causally linked to the other (Dolezal et al., 1997; Kalichman et al., 1998). However, some qualitative and experimental studies have suggested that excessive drinking could lead to risky sexual behaviors through lowering inhibitions and expectations that alcohol will enhance the sexual encounter (Maisto et al., 2012; Mutchler et al., 2013; Parsons et al., 2004). A review also concluded that there is an overall association between problematic drinking and having a sexually transmitted infection (STI) (Cook and Clark, 2005). Additionally, a recent study in Illinois found that raising taxes on alcohol, which has been shown to reduce excessive alcohol use (Wagenaar et al., 2009), resulted in a reduction in STIs (Staras et al., 2014).

Limitations of this study include that the sample is not generalizable to all MSM. It is a large venue-based sample with representation from cities across the U.S., which may be an improvement over small convenience samples. However, recruiting participants at venues may result in selection bias. MSM recruited at predominately bars and clubs may not be representative of all MSM. They could possibly engage in more risky behaviors than the MSM community as a whole, they might be drinking more, and it might result in a more "out" sample, i.e. a sample that more openly identifies as gay. This could result in the over-estimation of the prevalence of behaviors and could bias the associations. These data are not weighted to account for this bias or for non-response bias. In order to address these

concerns, we controlled for recruitment venue in the model. Conversely, the face-to-face survey could lead to under-reporting of socially undesirable behaviors (Dawson, 2003; Des Jarlais et al., 1999), which could result in under-estimation of the risky behaviors. This under-reporting could result in bias if men who are more likely to report honestly about binge drinking are also more likely to report honestly about their sexual risk behaviors. Another limitation of this study is that binge drinking did not necessarily occur at the time of the risk behaviors. Therefore, no suggestion of a causal relationship can be made; we have simply shown an association.

The findings of this study have important implications for planning and implementing public health interventions to reduce excessive and binge drinking among MSM. The Community Preventive Services Task Force recommends several policy strategies for reducing excessive alcohol use and related harms, including increasing alcohol taxes, regulating alcohol outlet density, and dram shop (commercial host) liability (Task Force on Community Preventive Services). The U.S. Preventive Services Task Force also recommends alcohol screening and brief counseling for excessive alcohol use among adults in primary care settings (Moyer and Preventive Services Task, 2013). Furthermore, HIV prevention interventions would benefit from incorporating into their programs efforts to assess and reduce excessive alcohol use due to its association with risky sexual behaviors.

CDC and its partners are pursuing a high-impact prevention approach to advance the goals of the National HIV/AIDS Strategy for the United States and maximize the effectiveness of current HIV prevention methods (Centers for Disease Control and Prevention, 2013b). This approach centers on using combinations of scientifically proven, cost-effective, and scalable interventions targeted to populations at greatest risk for HIV infection, including MSM. Biomedical and behavioral interventions, as well as other public health strategies (e.g., HIV testing, alcohol and substance abuse treatment programs) are important for reducing HIV transmission among MSM who engage in excessive alcohol consumption. However, for some of these interventions, such as preexposure prophylaxis (Grant et al., 2010), CDC recommends that clinicians screen patients for alcohol abuse as this may affect sexual risk behavior, hepatic or renal health, or medication adherence, which may affect decisions about the appropriateness of prescribing PrEP medication (Centers for Disease Control and Prevention, 2014b). Evidence-based strategies for reducing binge drinking are important to help reduce risky sexual behavior among MSM and facilitate the use of other effective interventions.

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**TABLE 1**

Binge drinking[a] prevalence[b] and frequency[c] by demographic characteristics among men who have sex with men who were current drinkers, National HIV Behavioral Surveillance, United States, 2011

| | Total | Binge Drinking Prevalence | Binge Drinking Frequency |
|---|---|---|---|
| | n | n (%) | Mean Episodes (SD) |
| **Total** | 6,796 | 4,008 (59.0) | 6.3 (6.9) |
| **Age group (yrs)** | | | |
| 18 - 24 | 1,846 | 1,098 (59.5) | 6.1 (6.6) |
| 25 - 34 | 2,405 | 1,514 (63.0) | 6.3 (6.8) |
| 35 - 49 | 1,867 | 1,080 (57.9) | 6.4 (7.3) |
| 50 | 678 | 316 (46.6) | 6.6 (7.7) |
| *p-value* | | <.001 | .74 |
| **Race/Ethnicity** | | | |
| Non-Hispanic white | 2,826 | 1,791 (63.4) | 6.5 (7.1) |
| Non-Hispanic black | 1,611 | 800 (49.7) | 6.3 (7.3) |
| Hispanic | 1,836 | 1,128 (61.4) | 6.2 (6.4) |
| Other race[d] | 511 | 281 (55.0) | 5.9 (6.6) |
| *p-value* | | <.001 | .49 |
| **Education** | | | |
| Less than high school | 340 | 218 (64.1) | 8.8 (9.6) |
| High school graduate | 1,518 | 885 (58.3) | 7.3 (7.9) |
| Some college | 2,297 | 1,373 (59.8) | 6.3 (6.8) |
| College graduate or more | 2,641 | 1,532 (58.0) | 5.4 (5.8) |
| *p-value* | | .13 | <.001 |
| **Annual household income ($)** | | | |
| 0-19,999 | 1,932 | 1,119 (57.9) | 7.2 (8.1) |
| 20,000-39,999 | 1,661 | 971 (58.5) | 6.1 (6.6) |
| 40,000-59,999 | 1,088 | 654 (60.1) | 5.9 (6.3) |
| 60,000 | 2,022 | 1,215 (60.1) | 5.8 (6.3) |
| *p-value* | | .45 | <.001 |
| **Drug use past year[e]** | | | |
| Yes | 2,437 | 1,709 (70.1) | 7.4 (7.5) |
| No | 4,353 | 2,295 (52.7) | 5.5 (6.4) |
| *p-value* | | <.001 | <.001 |
| **Survey venue** | | | |
| Bar/Club | 4,779 | 2,983 (62.4) | 6.5 (7.0) |
| Other[f] | 2,017 | 1,025 (50.8) | 5.6 (6.7) |
| *p-value* | | <.001 | <.001 |

[a] Binge drinking was defined as 5 or more alcohol drinks in one sitting in the past 30 days.

*b*Binge drinking prevalence = total number of respondents who reported at least one binge drinking episode during the past 30 days divided by the total number of respondents who reported drinking alcohol in the past 30 days.

*c*Binge drinking frequency = average number of binge-drinking episodes reported by all binge drinkers during the past 30 days.

*d*Other race includes American Indian, Alaskan Native, Asian, Native Hawaiian, Pacific Islander, multiple race/ethnicities

*e*Drug use includes any injection drug, crystal meth, crack cocaine, powered cocaine, downers, pain killers, hallucinogens, ecstasy, heroin, poppers, GHB, ketamine, or other non-injection drug (excluding marijuana)

*f*Other venue includes cafes and restaurants, house ball events, fitness club or gym, Gay Pride or similar event, social organizations, parks and beaches, retail businesses, street locations, raves, circuit parties, and similar events, and sex establishments or environments

**TABLE 2**

Alcohol consumption patterns by binge drinking[a] status among men who have sex with men who were current drinkers, National HIV Behavioral Surveillance, United States, 2011

| | Non-Binge Drinkers | Binge Drinkers | |
|---|---|---|---|
| | n (%) | n (%) | *p-value* |
| **Frequency of alcohol consumption** | | | <.001 |
| < 1 day/week | 1,010 (36.2) | 441 (11.0) | |
| 1 - 2 days/week | 1,029 (36.9) | 1,202 (30.0) | |
| > 2 days/week | 749 (26.9) | 2,365 (59.0) | |
| **Usual quantity of drinks per day** | | | <.001 |
| 1 | 524 (18.8) | 116 (2.9) | |
| 2 | 1,127 (40.4) | 567 (14.2) | |
| 3 | 775 (27.8) | 927 (23.2) | |
| 4 | 298 (10.7) | 740 (18.5) | |
| 5 | 63 (2.3) | 1,653 (41.3) | |
| **Number of binge drinking episodes (past month)** | | | |
| 1-2 | -- | 1536 (38.3) | |
| 3-4 | -- | 794 (19.8) | |
| 5-9 | -- | 785 (19.6) | |
| 10 | -- | 892 (22.3) | |
| **Total (n)** | 2,788 | 4,008 | |

[a]Binge drinking was defined as 5 or more alcohol drinks in one sitting in the past 30 days.

**TABLE 3**

Prevalence of sexual risk behaviors by binge drinking[a] status and frequency[b] among men who have sex with men who were current drinkers, National HIV Behavioral Surveillance, United States, 2011

| | Non-Binge Drinkers | Binge Drinkers | | Binge Drinking Frequency | |
|---|---|---|---|---|---|
| | n (%) | n (%) | *p-value* | Mean Episodes (SD) | *p-value* |
| **Discordant receptive CAI[c] at last sex** | | | <.001 | | <.001 |
| Yes | 146 (5.2) | 298 (7.4) | | 8.4 (8.7) | |
| No | 2,639 (94.8) | 3,705 (92.6) | | 6.1 (6.7) | |
| **Discordant insertive CAI at last sex** | | | .001 | | <.001 |
| Yes | 222 (8.0) | 411 (10.3) | | 7.8 (8.8) | |
| No | 2,564 (92.0) | 3,595 (89.7) | | 6.1 (6.7) | |
| **Exchange sex at last sex** | | | <.001 | | <.001 |
| Yes | 90 (3.2) | 219 (5.5) | | 10.5 (9.6) | |
| No | 2,696 (96.8) | 3,786 (94.5) | | 6.1 (6.7) | |
| **Concurrent partners** | | | <.001 | | <.001 |
| Yes | 956 (41.9) | 1,549 (48.5) | | 7.0 (7.5) | |
| No | 1,325 (58.1) | 1,645 (51.5) | | 5.4 (6.0) | |
| **Number of CAI partners** | | | <.001 | | <.001 |
| None | 1,284 (46.2) | 1,532 (38.3) | | 6.1 (6.8) | |
| 1 partner | 943 (33.9) | 1,354 (33.9) | | 5.5 (6.2) | |
| 2 partners | 554 (19.9) | 1,114 (27.9) | | 7.6 (7.8) | |
| **Number of CAI partners – continuous (mean (SD))** | 1.4 (4.4) | 1.9 (8.9) | .004 | -- | |

[a] Binge drinking was defined as 5 or more alcohol drinks in one sitting in the past 30 days.

[b] Binge drinking frequency = average number of binge-drinking episodes reported by all binge drinkers during the past 30 days.

[c] CAI = condomless anal intercourse

**Table 4**

Associations[a] between sexual behaviors and binge drinking[b] among men who have sex with men who were current drinkers, National HIV Behavioral Surveillance, United States, 2011

| Variables | Receptive CAI[c] with discordant/unknown status partner at last sex | Insertive CAI with discordant/unknown status partner at last sex | Exchange sex at last sex | Concurrent partners | #CAI partners |
|---|---|---|---|---|---|
| | aPR[d] (95% CI) | aPR (95% CI) | aPR (95% CI) | aPR (95% CI) | aPR (95% CI) |
| **Model 1: Binge drinking** | n=6,680 | n=6,684 | n=6,683 | n=5,389 | n=6,674 |
| Non-binge drinkers | Reference | Reference | Reference | Reference | Reference |
| Binge drinkers | **1.33 (1.09-1.62)** | **1.20 (1.02-1.41)** | **1.35 (1.06-1.70)** | **1.11 (1.05-1.18)** | **1.18 (1.01-1.37)** |
| **Model 2: Binge drinking frequency[e]** | n=3,944 | n=3,947 | n=3,946 | n=3,147 | n=3,941 |
| 1-2 episodes | Reference | Reference | Reference | Reference | Reference |
| 3-4 episodes | 1.08 (0.78-1.50) | 1.01 (0.77-1.31) | 1.39 (0.94-2.06) | 1.03 (0.92-1.14) | 1.20 (0.90-1.60) |
| 5-9 episodes | 1.31 (0.97-1.78) | 1.00 (0.77-1.30) | 1.33 (0.89-1.97) | **1.14 (1.03-1.26)** | 1.10 (0.87-1.39) |
| 10 episodes | **1.42 (1.07-1.90)** | 1.08 (0.85-1.38) | **1.85 (1.33-2.57)** | **1.22 (1.11-1.33)** | **1.40 (1.10-1.79)** |

[a]Adjusted for age, race/ethnicity, education, income, venue type, drug use, and city.

[b]Binge drinking was defined as 5 or more alcohol drinks in one sitting in the past 30 days.

[c]CAI = condomless anal intercourse

[d]aPR = adjusted prevalence ratio.

[e]Binge drinking frequency = average number of binge-drinking episodes reported by all binge drinkers during the past 30 days